

## *Curriculum Vitae*

### **Ashley Gerard Davies, Ph. D. Research Scientist**

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**Citizenship** UK, US

**Current Position** Research Scientist (IV), Jet Propulsion Laboratory

#### **Career**

Jet Propulsion Laboratory, Pasadena, CA, USA (1996 – present)

- Co-I, *Europa Mission* Mapping Imaging Spectrometer for Europa (MISE) (2015+)
- Research Scientist IV, Geophysics and Planetary Geosciences (2015+)
- Research Scientist IV, Comets, Asteroids and Satellites Group (2003 - 2014)
- New Millennium Program-Autonomous Sciencecraft Experiment (ASE) Co-I and Lead Scientist (2001 - present)
- ASTER Team Associate (2004 - present)
- Research Scientist, *Galileo* NIMS Team (2001 - 2002)
- Scientist, *Galileo* NIMS team (1996 - 2001)

National Research Council Resident Research Associate, NASA/JPL (1994 - 1996)

UK Meteorological Office: Higher Scientific Officer (1990 - 1994)

- Short-Range Forecast Division (Research Scientist) (1991 - 1994)
- Systems Programmer (ARTIFAX) (1990 - 1991)

#### **Expertise**

- Planetary science: in particular, the jovian satellite Io
- Remote sensing of volcanic activity
- Analysis of hyperspectral and multispectral data (*Galileo* NIMS and SSI; *EO-1* Hyperion and ALI; *Terra* ASTER and *Terra/Aqua* MODIS)
- Numerical and analytical modelling of volcanic processes on Io, Earth, Titan and Enceladus... across the solar system.
- Autonomous spacecraft and sensor web operations

Broad fieldwork experience: includes Antarctica (Erebus), Ethiopia (Erta'Ale), Hawai'i (Kilauea and Mauna Loa), and Iceland (Eyjafjallajökull, Laki).

#### **Education**

**Undergraduate:** Bachelor of Science degree with Honours in Combined Studies (Astronomy and Geology) from the University of Hertfordshire, UK, 1984.

**Doctorate:** Ph.D. in planetary volcanism from Lancaster University, UK, 1988. Prof. Lionel Wilson and Prof. Harry Pinkerton, advisors. Thesis: “Sulphur-Silicate Interactions on the Jovian Satellite, Io”.

**National Research Council Post-Doctoral Research Associateship:** 1994-1996 Jet Propulsion Laboratory, with Dr. Dennis Matson and Dr. Torrence V. Johnson, modelling ground-based observations of volcanic thermal emission from Io.

### **Leadership**

- Autonomous Sciencecraft Experiment Lead Scientist: 2001 – present
- Volcano Sensor Web Lead Scientist: 2004 – present
- JIMO Mission Study Science Lead (single-spacecraft option): 2003
- P.I. on multiple successful NASA-funded investigations (see below)

### **Spacecraft missions and technology development**

- *Europa Clipper* Mapping Imaging Spectrometer for Europa (MISE), selected in May 2015 to explore Europa and other bodies in the jovian system.
- *Galileo* Near Infrared Mapping Spectrometer (NIMS) Team Member – Quantifying volcanic processes on Io; modelling volcanic processes.
- *Earth Observing 1* Autonomous Sciencecraft Experiment (ST-6) Lead Scientist – increasing mission science return through use of autonomy.
- Volcano Sensor Web – Lead Scientist – a world-spanning eruption alert system using eruption alerts to generate spacecraft observations: a fully-autonomous system.
- *Terra* ASTER - Associate Team Member - Data mining the ASTER Volcano Archive.
- *Io Volcano Observer* (IVO): Co-I on Discovery proposal (P.I. A.S. McEwen, U. Arizona). Decision pending.

### **Research awards (as P.I. – as Co-I not shown)**

- NASA Planetary Geology & Geophysics Program: 2001-present (multiple awards)
- NASA Outer Planets Research Program: 2002-present (multiple awards)
- NASA Jupiter Data Analysis Program: 2000-2003
- NASA Advanced Information Science and Technology Program: (\$500K) 2005
- JPL Research and Technology Development Program, P.I.: 2003-2006 (multiple awards)

### **Professional Societies**

Fellow, Royal Astronomical Society

Member, Royal Astronomical Society Joint Association for Geophysics

Member, American Geophysical Union

Member, Division of Planetary Science, American Astronomical Society

Member, International Association for Volcanism and the Chemistry of the Earth's Interior

Member, International Astronomical Union (IAU Commission 16)

### **Awards**

2011: NASA Software of the Year: Honourable mention: “Sensor Web Toolbox”

2007: NASA Space Act Award: “Autonomous Volcano Sensor Web”

2005: **NASA Software of the Year Award Winner** “Autonomous Sciencecraft Experiment”.

2005: NASA Group Achievement Award to the Autonomous Sciencecraft Experiment Team.

2003: Technically Significant Technology Award: "Software for the *Techsat-21* Autonomous Sciencecraft Experiment (ASE)".

2003: JPL Team Bonus Award: "*Jupiter Icy Moon Orbiter (JIMO) Studies*".  
1998: NASA Group Achievement Award to the *Galileo* Project Team.  
1997: NASA Group Achievement Award to the *Galileo* Orbital Operations Recovery Team.  
1994: National Research Council Postdoctoral Fellowship (1994-1996)

### **New Technology Reports and Technical Brief Awards**

(C= Computer Program. H = Hardware)

- 48583 Automated estimation of volcanic plume heights in satellite imagery using machine learning and computer vision processing – 26 Jan 2012 (C)
- 48148 Multi-source autonomous response for targeting and monitoring of volcanic activity – 01 Apr 2011 (C)
- 48123 Autonomous Hyperspectral Data Processing, Product Generation and dissemination for Rapid Response in Volcanic Emergencies – 18 Mar 2011 (C)
- 47471 Onboard science and applications algorithm for hyperspectral data reduction – 14 Dec 2009 (H)
- 45998 Web Processing Service (WPS) software framework – 11 Mar 2008 (C)
- 45445 Volcano Monitor: Autonomous Triggering of *in situ* Sensors on Kilauea volcano, HI, from Eruption Detection by the *EO-1* Spacecraft – 14 Aug 2007 (H)
- 42523 An Autonomous Earth-Observing Sensor Web – 13 Jul 2005 (C)
- 41993 The NMP ST-6 Autonomous Sciencecraft Experiment (ASE) - 18 Mar 2005 (C)
- 30784 Software for the *TechSat-21* Autonomous Sciencecraft Experiment (ASE) – 15 Aug 2002 (C)
- 30442 Software for Onboard Science Analysis – 16 Nov 2001 (C)
- 30355 Software for the *Techsat-21* Autonomous Sciencecraft Constellation (ASC) – 20 Aug 2001 (C)
- 30201 Goal-directed scientific exploration using multiple rovers – 15 Mar 2001 (C)

**Other activities:** Member, JPL Urban Search and Rescue (USAR) Team, specializing in medical and rope rescue. FEMA certifications in Incident Management IS-100b and IS-200b.

**Professional service:** Review panels for NASA ROSES Planetary Geology and Geophysics program. ROSES proposal reviewer: Planetary Geology and Geophysics, Planetary Astronomy, Outer Planets Research programs, and others. Review of manuscripts for *Icarus*, *Geophysical Research Letters*, *Journal of Geophysical Research*, *Remote Sensing of Environment*, *Journal of Volcanology and Geothermal Research*, and others.

### **Television work**

- **“NOVA”**. PBS. **“Finding Life Beyond Earth”**. PBS’s *NASA Year of the Solar System* 2-hour special. First broadcast 19 Oct 2011.
- **“Known Universe”**. National Geographic’s **“Biggest Cosmic Blasts”**. Broadcast 2 June 2011.
- **“Wonders of the Solar System”**. BBC, episode 4 (UK/US version); episodes 3 and 4 (worldwide version). Broadcast in US August 2010.
- **“95 Worlds and Counting”**. Discovery Channel. Broadcast September 1999.

## Online

A lecture entitled “**Volcanoes Near, Far and Really Far Away**”, given at the Library of Congress, Washington, DC, on 27 October 2010, can be viewed on YouTube at <http://www.youtube.com/watch?v=3GldOHRG9p4>

## References

### Book

“**Volcanism on Io: a Comparison with Earth**”, A. G. Davies (2007) Cambridge University Press, Planetary Science Series no. 7. 372 pages. Published in paperback July 2014. Available as ebook, June 2015, through Cambridge University Press.

### Refereed Publications

1. Davies, A. G., G. J. Veeder, D. L. Matson and T. V. Johnson (2015) Map of Io’s Volcanic Heat Flow, *Icarus*, 262,67-78. doi: <http://dx.doi.org/10.1016/j.icarus.2015.08.003>.
2. Davies, A. G., Chien, S., Tran, D. and Doubleday, J. (2015) The NASA Volcano Sensor Web, Advanced Autonomy, and the Remote Sensing of Volcanic Eruptions, Chapter in the Geological Society of London-IAVCEI book “Detecting, Modeling and Responding to Effusive Eruptions”, eds. A. J. L. Harris, T. De Groove, P. Labazuy and S. Carn, in press.
3. Harris, A. et al., inc. A. G. Davies (2015) Conclusion: Recommendations and findings of the RED SEED working group, chapter in Geological Society of London-IAVCEI book “Detecting, Modeling and Responding to Effusive Eruptions”, eds. A. J. L. Harris, T. De Groove, P. Labazuy and S. Carn. In press.
3. Harris, A. et al., inc. A. G. Davies (2015) Appendix A2: Collation of hot spot detection algorithms, chapter in Geological Society of London-IAVCEI book “Detecting, Modeling and Responding to Effusive Eruptions”, eds. A. J. L. Harris, T. De Groove, P. Labazuy and S. Carn. In press.
4. Jones, S. M. S. Anderson, A. G. Davies, J. P. Kirby, M. J. Burchell and M. J. Cole (2015) Aerogel Dust Collection for in situ Mass Spectrometry Analysis, *Icarus*, 247, 71-76, doi: 10.1016/j.icarus.2014.09.047.
5. Veeder, G. J., Davies, A. G., Matson, D. L., Johnson, T. V., Williams, D. A. and Radebaugh, J. (2015) Io: Heat Flow from Small Volcanic Features, *Icarus*, 245, 379-410. doi: 10.1016/j.icarus.2014.07.028.
6. Davies, A. G., G. J. Veeder, S. I. Hill, D. L. Matson and T. V. Johnson (2014) Charting thermal emission variability at Amirani with the *Galileo* NIMS Io Thermal Emission Database (NITED), *Icarus*, 241, 190-199. doi: 10.1016/j.icarus.2014.06.034.
7. de Pater, I., Davies, A. G., McGregor, A., Trujillo, C., Ádámkovics, M., Veeder, G. J., Matson, D. L., Leone G. and the Gemini Io Team (2014) Global Near-IR Maps from Gemini-N and Keck in 2010, with a Special Focus on Janus Patera and Kanehekili Fluctus, *Icarus*, 242, 379-395. doi: 10.1016/j.icarus.2014.06.019.

8. de Pater, I., Davies, A.G., Ádámkovics, M., Ciardi, D.R (2014) Two New, Rare, High-Effusion Outburst Eruptions at Rarog and Heno Paterae on Io. *Icarus*, 242, 365-378. doi: 10.1016/j.icarus.2014.06.016.
9. de Kleer, K., de Pater, I., Ádámkovics, M., Davies, A.G. (2014) Near-Infrared Monitoring of Io & Detection of a Violent Outburst Gemini Eruption, *Icarus*, 242, 352-364. doi: 10.1016/j.icarus.2014.06.006.
10. Cataldo, E., A. G. Davies and L. Wilson (2013) Near-vertical supersonic and shock-free gas/magma flow at fissure volcanoes: Application to Pillan, Io. *Icarus*, 226, 1171–1176. doi:10.1016/j.icarus.2013.06.035.
11. Davies, A. G., S. Chien, J. Doubleday, D. Tran, T. Thordarson, M. T. Gudmundsson, Á. Höskuldsson, S. S. Jakobsdóttir, R. Wright and D. Mandl (2013) Observing Iceland's Eyjafjallajökull 2010 Eruptions with the Autonomous NASA Volcano Sensor Web, *JGR-Solid Earth*, 118, 1–21, doi:10.1002/jgrb.50141.
12. Chien, S., D. McLaren, D. Tran, A. G. Davies, J. Doubleday and D. Mandl (2013) Onboard Product Generation on Earth Observing One: A pathfinder for the proposed HypIRI Mission Intelligent Payload Module. Special Issue on the *Earth Observing One (EO-1)* Satellite Mission: Ten Years in Space, *IEEE JSTARS*, 6, no. 2, 257-264.
13. Davies, A. G., G. J. Veeder, D. L. Matson and T. V. Johnson (2012) Charting thermal emission variability at Pele, Janus Patera and Kanehekili Fluctus with the *Galileo* NIMS Io Thermal Emission Database (NITED), *Icarus*, **221**, 466-470. doi:10.1016/j.icarus.2012.04.01.
14. Matson, D. L., J. C. Castillo-Rogez, A. G. Davies, T. V. Johnson and J. Lunine (2012) Enceladus: A Hypothesis For Bringing Both Heat And Chemicals To the Surface, *Icarus*, 221, 53-62. doi.org/10.1016/j.icarus.2012.05.031.
15. Veeder, G. J., A. G. Davies, D. L. Matson, T. V. Johnson, D. A. Williams and J. Radebaugh (2012) Io: Volcanic Thermal Sources and Global Heat Flow, *Icarus*. **219**, 701-722. doi:10.1016/j.icarus.2012.04.004.
16. Davies, A. G. G. J. Veeder, D. L. Matson and T. V. Johnson (2012) Io: Charting thermal emission variability with the *Galileo* NIMS Io Thermal Emission Database (NITED): Loki Patera, *Geophysical Research Letters*, **39**, L01201, doi:10.1029/2011GL049999.
17. Davies, A. G., L. Keszthelyi and A. S. McEwen (2011) Estimating Eruption Temperature From Thermal Emission Spectra of Lava Fountain Activity in the Erta'Ale (Ethiopia) Volcano Lava Lake – Implications for Observing Io's Volcanoes, *GRL*, **38**, L21308, doi: 10.1029/2011GL049418.
18. Davies A. G. (2011) Lava lakes on Earth and Io, *Planetary Report*, vol. XXXI, no. 2, 10-15.
19. Davies A. G. and M. E. Ennis (2011) The variability of volcanic activity at Zamama,

- Culann, and Tupan Patera on Io as seen by the *Galileo* Near Infrared Mapping Spectrometer, *Icarus*, **215**, 401-416.
20. Veeder, G. J., A. G. Davies, D. A. Williams, D. L. Matson, T. V. Johnson and J. Radebaugh (2011) Io: Heat flow from Dark Paterae, *Icarus*, vol. **212**, no. 1, p. 236-261. doi:10.1016/j.icarus.2010.09.026.
  21. Leone, G., Wilson, L. and Davies, A. G. (2011) The geothermal gradient of Io: consequences for lithosphere structure and volcanic eruptive activity, *Icarus*, **211**, 623-635, doi:10.1016/j.icarus.2010.10.016.
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  23. Davies, A. G., C. Sotin, D. L. Matson, J. C. Castillo-Rogez, T. V. Johnson, M. Choukroun, and K. H. Baines (2010) Atmospheric control of the cooling rate of impact melts and cryolavas on Titan's surface, *Icarus*, **208**, 887-895, doi:10.1016/j.icarus.2010.02.025.
  24. Davies, A.G., L. P. Keszthelyi and A. J. L. Harris (2010) The Thermal Signature of Volcanic Eruptions on Io and Earth, *JVGR*, **194**, 75-99, doi:10.1016/j.jvolgeores.2010.04.009.
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36. Davies, A. G., L. Wilson, D. L. Matson, G. Leone, L. P. Keszthelyi and W. Jaeger (2006) The pulse of the volcano: discovery of episodic activity at Prometheus on Io, *Icarus*, **184**, 460-477.
37. Davies, A. G., S. Chien, V. Baker, T. Doggett, J. Dohm, R. Greeley, F. Ip, R. Castaño, B. Cichy, G. Rabideau, D. Tran and R. Sherwood (2006) Monitoring Active Volcanism with the Autonomous Sciencecraft Experiment on EO-1, *Rem. Sens. Environ.*, **101**, no. 4, 427-446.
38. Doggett, T., R. Greeley, A. G. Davies, S. Chien, B. Cichy, R. Castano, K. Williams, V. Baker, J. Dohm and F. Ip (2006) Autonomous detection of cryospheric change with Hyperion onboard Earth-Observing 1, *Rem. Sens. Environ.*, **101**, no. 4, 447-462.
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40. Davies, A. G., S. Chien, R. Wright, A. Miklius, P. R. Kyle, M. Welsh, J. B. Johnson, D. Tran, S. R. Schaffer, and R. Sherwood (2006) Sensor web enables rapid response to volcanic activity, *Eos*, **87** (1), 1&5.
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45. Chien, S., B. Cichy, A. G. Davies, D. Tran, G. Rabideau, R. Castano, R. Sherwood, D. Mandl, S. Frye, S. Schulman, J. Jones and S. Grosvenor (2005) An Autonomous Earth-Observing Sensorweb, *IEEE Intelligent Systems*, **20**, no. 3, 16-24.
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## IAU telegrams

1. CBET 3632 - 20130817 (17 Aug 2013). Outburst on Io (actually, two outbursts in vicinity of Rarog Patera.
2. IAUC 9259 (3 Sept 2013). A third outburst on Io, this time in the northern hemisphere.

## Invited Presentations and Seminars

1. Davies, A. G. (2014) *Earth-Observing 1*, the Volcano Sensor Web, and Observations of Icelandic Eruptions. Presentation to the faculty of the University of Iceland, Reykjavik, Iceland, 19 November 2014.
2. Davies, A. G., L. Keszthelyi, A. S. McEwen (2013) Thermal Remote Sensing of Lava Lakes on Io and Earth, AGU Fall Meeting 2013, San Francisco, CA, Dec 2013, abstract P52A-07.
3. Davies, A. G., C. Sotin, M. Choukroun, D. L. Matson and T. V. Johnson (2013) Evaluating methane clathrate destabilization by heat from lava flows as a mechanism for supplying Titan's atmospheric methane, IAVCEI 2013, Kagoshima, Japan, July 2013, 3K-P1, Abstract 1435-2.
4. Davies, A. G. (2013) The NASA Volcano Sensor Web. Workshop on Satellite-Data-Driven Detection, Tracking and Modelling of Volcanic Hot Spots, Laboratoire Magmas et Volcans, Université Blaise Pascal, Clermont Ferrance, France, 28-30 May 2013.
5. Davies, A. G., G. J. Veeder, D. L. Matson and T. V. Johnson (2012) Charting The Variability of Volcanic Eruptions on Io, invited, AOGS-2012, PS09-A003, Singapore, 17 August 2012.
6. Davies, A. G. University of Edinburgh, Edinburgh, UK. "Volcanism on Io - Massive Lava Flows, Gigantic Lava Lakes, and the Question of Io's Interior State". 15 February 2012.
7. Davies, A. G. Lunar and Planetary Institute, Houston, TX. "Active lava lakes as windows into Io's interior". 11 November 2011.
8. Davies, A. G. Pomona College, Pomona, CA Geology Department Colloquium. "Lava lakes on Io and Earth – the Key to Unlocking the Secrets of the Jovian System?" 22 March 2011.
9. Davies, A. G. Goddard Space Flight Center, MD. "Lava lakes on Earth and Io – the Key to Understanding the Jovian System?". 29 October 2010.
10. Davies, A. G. Library of Congress, Washington, DC. "Volcanoes: Near, Far and Really Far Away", 27 October 2010. Streaming video of this lecture is available at:  
  
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11. Davies, A. G. and S. Chien (2010) University of Iceland, Reykjavik. The JPL Volcano Sensor Web and the 2010 Eruption of Eyjafjallajökull. 22 June 2010.
12. Davies, A. G., (2008) Remote Sensing of Volcanic Activity on Io and Earth, and the Derivation of Eruption Style, presentation to the Io Workshop, UC Berkeley, CA, 11 Dec 2008.

13. Davies, A. G., D. L. Matson, J. C. Castillo, T. V. Johnson and C. Sotin (2008) Cryolava Emplacement on Titan and Resulting Morphology: Modelling Strategy. Geophysical Research Abstracts, Vol. 10, EGU2008-A-04430, European Geophysical Union General Assembly, Vienna, Austria, April 2008.
14. Davies, A. G. (2007) IUGG XXXVI General Assembly 2007: Invited presentation to Steering Committee of World Organisation of Volcano Observatories (WOVO) on the Volcano Sensor Web and the 2006 Eruption of Nyamulagira.
15. Davies, A. G., S. Chien, R. Castano, D. Tran and S. Scharenbroich (2006) (Invited) Increasing Mission Science Return Through Use of Spacecraft Autonomy and Sensor Webs: A Volcanology Example, *Eos Trans. AGU* **87** (52), Fall Meet. Suppl., Abstract IN52A-01.
16. Davies, A. G. (2006) Volcanism on Io: thermal modeling of activity at Pillan and Loki Patera, Geology Dept. Lunchtime Seminar Series, UCLA, October 5, 2006.
17. Davies, A. G. (2006) Volcanic Heat and Antarctic Ice: studying high-temperature volcanism on Earth and Io, Earth and Space Sciences Dept. Seminar Series, October 5, 2006.
18. Davies, A. G. (2006) Science 101 Lecture Series, Div. 32, JPL: Volcanic Heat and Antarctic Ice: studying high-temperature volcanism on Io and Earth, June 28, 2006, JPL.
19. Davies, A. G. (2005) Observing volcanic activity with NASA's Autonomous Sciencecraft Experiment. Seminar, New Mexico Institute of Mining and Technology, Socorro, New Mexico, February 2005.
20. Davies, A. G. (2004) Volcanism on Io and Earth. 32-International Geological Congress, Florence, Italy, August 2004. (invited talk).
21. Davies, A. G. (2003) Volcanism on Io. International Astronomical Union Congress 25, Sydney, Australia, July 2003 (invited talk).
22. Davies, A. G. (2003) Episodic volcanism at Prometheus on Io: a comparison with Kilauea, Hawai'i. Hawai'i Institute of Geophysics and Planetology (HIGP), University of Hawai'i, 30 May 2003 (seminar).
23. Davies, A. G. (2003) Modelling IR data of Io's eruptions (invited talk), Workshop on Volcanology on Earth and Io, Center for Integrative Planetary Science (CIPS), University of California, Berkeley, 5 March 2003.
24. Davies, A. G. (2001) Volcanism on Io; quantifying volcanic parameters from *Galileo* data. Seminar at the Center for Integrative Planetary Science (CIPS), University of California, Berkeley, 10 October 2001.
25. Davies, A. G., S. Doute and R. Lopes-Gautier (2000) *Galileo* NIMS observations of Io's surface, IAU XXIV, Manchester, UK, August 2000.

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27. Davies, A. G. (1999) Recent observations of Io from the *Galileo* Spacecraft. In "Advances in Planetary Science" Royal Astronomical Society-UK Planetary Forum, London, UK, January 1999. (invited).
28. Davies, A. G. (1998) *Galileo* observations of volcanism on Io. Seminar given at the Lunar and Planetary Institute, Houston, TX, August 1998.
29. Davies, A. G. (1997) Thermal emission from volcanoes: observations and models. "Io during the *Galileo* Era": A Lowell Observatory Conference, p 22-23. (invited).